Texas Prefreshman Engineering Program (TexPREP) Collaboration Project

Kevin Urbanczyk, Sul Ross State University

Award Number: 2007-34822-18081; $440,000

Rudy Reyna, University of Texas at San Antonio; Lisa Thierot, Dallas County Community College; Shaunyale Canada, Victoria College

USDA Mission Areas: REE and NRCS, USDA Collaborator: NRCS

DESCRIPTION:

The Texas Prefreshman Engineering Program (TexPREP) Collaboration is an initiative among Sul Ross State University (lead), Victoria College, Dallas County Community College District, and the University of Texas at San Antonio.

The primary education need area addressed by the TexPREP Collaboration will **strengthen underrepresented student recruitment and retention** in conjunction with implementing water science projects.

This need area supports **CSREES's strategic objective 6.1** and the **Water Science discipline**.

This grant supports educational need areas (c) and (e) by adding *service-learning* whereby students can address community-based water issues. Students will use Geographic Information Systems and system dynamics tools in support of educational need area (a) regarding new educational models. Educational need area (b) will be addressed since faculty development is required.

The USDA sponsor for this proposal is the Natural Resources Conservation Service. Other partners include local water agencies.

This grant will leverage work developed under the current USDA grant for San Antonio PREP including program evaluation.

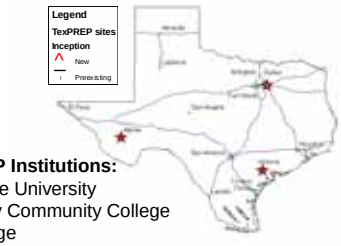
Expected results:

- Three new TexPREP sites.
- Over 5,100 students will participate in TexPREP.
- Students
  - 75% will be underrepresented students.
  - 95% will go to college and 86% will graduate.
  - 85% will increase their knowledge of water science.
  - 100% will increase their knowledge of opportunities in the agricultural sciences.

OBJECTIVES:

The TexPREP Collaboration's objectives include:

1. Establish three new TexPREP sites at: Sul Ross University, Victoria College and in Dallas with the Dallas Community College District (El Centro College and Richmond College) and Southern Methodist University.
2. Increase the number of underrepresented high school students at the TexPREP Collaboration's sites who will ultimately pursue technology, mathematics, science or engineering studies in college and graduate from college;
3. Reinforce the science and mathematics preparation of these students in the pursuit of careers related to the nation's physical and natural sciences;
4. Acquaint students with professional opportunities in technology, mathematics, engineering, and science, particularly the water sciences.
5. Incorporate alternative and innovative instructional delivery systems into the TexPREP curriculum, namely service-learning and "charrettes," geographic information systems, and systems dynamics tools as a new approach for problem-solving and experiential learning with a classroom approach that encourages students to take more ownership in their learning.
6. Provide professional development for teachers with regards to water science and the new instructional delivery system based on service-learning and "charrettes," and on utilization of the systems dynamics and geographic information systems tools.

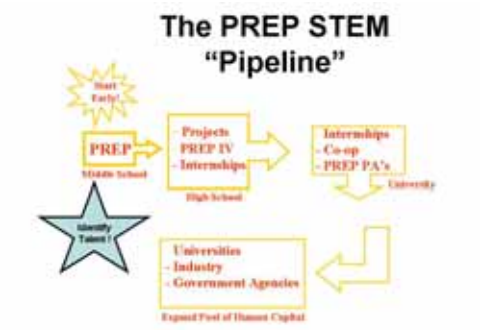


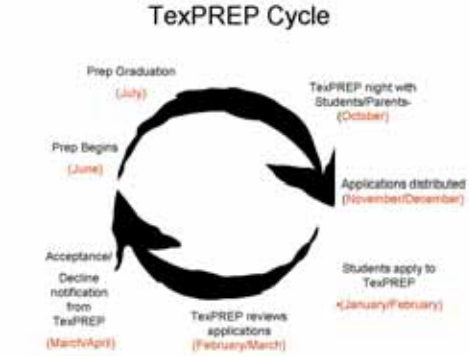
New TexPREP Institutions:

- Sul Ross State University
- Dallas County Community College
- Victoria College

Existing TexPREP Institutions:

Site	Year of Inception	Campus
Amarillo	1990	Amarillo College
Arlington	1995	University of Texas at Arlington
Brownsville	1986	University of Texas at Brownsville
Corpus Christi	1987	Del Mar College
Dallas	1995	El Centro Community College and University of Texas at Dallas
Edinburg	1986	University of Texas-Pan American
El Paso	1989	University of Texas at El Paso
Fort Worth	1995	Texas Wesleyan University
Harlingen	1997	Texas State Technical College
Houston	1989	University of Houston Downtown
Laredo	1986	Texas A&M International University
Lubbock	1986	Texas Tech University
San Angelo	2000	Angelo State University
San Antonio	1979	St. Philip's College
San Antonio	1979	Palo Alto College
San Antonio	1979	Northwest Vista college
San Antonio	1979	Our Lady of the Lake University
San Antonio	1979	San Antonio College
San Antonio	1979	University of the Incarnate Word
San Antonio	1979	St. Mary's University
San Antonio	1979	University of Texas at San Antonio (1604 and downtown)





Texas Prefreshman Engineering Program (TexPREP)

The project aligns with the USDA Research, Education and Economics (REE) and Natural Resources and Environment (NRE) mission areas.

TexPREP Mission:

- Focus on building a high quality and diverse 21st century workforce, by serving target groups: women and members of minority groups who are traditionally underrepresented in the areas of science and engineering.
- Identify middle and high school students with aptitude and interest in math, science, engineering, and technology and increase their potential for careers in these areas.
- Promote high achievement and provide students with the necessary reinforcement to successfully pursue higher education and careers in math, science, engineering, and technology.

DISCUSSION:

The TexPREP Collaboration will introduce system dynamics, add service-learning and "charrettes" with activities based on addressing community needs associated with water quantity and quality as a way of improving the quality of agricultural sciences education.

The TexPREP Collaboration will use a creative approach to teach students how they can use systems dynamics tools to address water quality and other related problems. Water quality, renewability, and various engineering analysis can be simulated and researched by utilizing systems dynamics tools and systems thinking as an innovative way of solving problems. Systems dynamics models can be developed on paper or they can be simulated on a computer by using a software program to replicate particular elements and variables within a system. With systems dynamics, students will take a non-linear approach to problem solving and work with the dynamics of a problem including, getting a much stronger understanding of how different variables interrelate within a system and how they change over time. Systems dynamics is an innovative tool that can be easily applied to better enhance the understanding of these concepts and aid in encouraging students to learn about the fields of engineering, agriculture, computer science, and water science. Systems dynamics has been found to engage students in the learning process due to the hands-on approach and it has been found to be particularly effective with underrepresented students.